Membrane Filtration: When There Is No Room for Error

Here's the story of a wastewater remediation company that found a way to cost-effectively purify water while meeting EPA regulations and operating with minimal manual intervention

Just the Facts About Wastewater Treatment

As the EPA has placed more stringent restrictions on the discharge of industrial wastewater, many manufacturers are choosing to outsource their wastewater treatment to companies that specialize in this complex and heavily regulated function. Central Wastewater Treatment of Wisconsin (CWT) is one such wastewater remediation provider. CWT serves more than 35 customers throughout the state of Wisconsin, specializing in removing metal and oil deposits from industrial wastewater and making the water clean enough to be released into a municipal sewage system. CWT was founded in late 2003 when new EPA regulations were making it increasingly difficult for manufacturers to treat their own wastewater. The changes caused several local treatment facilities to go out of business because these conventional treatment facilities could not afford to change their entire processes to meet stricter EPA guidelines.

The 2003 EPA guidelines primarily address classification and separation of wastewater streams for treatment. Previously, high concentrations of a contaminant in one type of wastewater could be mixed with other types of wastewater and diluted to an acceptable level. The new regulations disallow mixing wastewater streams of different types, thus forcing plants to treat these streams separately. These new requirements created a market opportunity that CWT filled. CWT processes small batches of wastewater for many different customers who are typically involved in metalworking, such as die-casting and machining operations, producing difficult-to-treat wastewater that is high in metal and oil content. The facility meets all the standards and regulations of the EPA, the Wisconsin Department of Natural Resources, and the local Milwaukee Metropolitan Sewerage District. Its customers know that wastewater outsourced to CWT will be treated and disposed of properly, according to these regulations. In designing the new wastewater treatment facility, John Scherff, the owner of CWT, sought a treatment system that would reliably and cost-effectively purify the water, meet regulatory requirements, and operate automatically with minimal manual

intervention.

"I knew that membrane filtration technology provides the best treatment method for my application because it provides a positive physical barrier that ensures solids and other contaminants are removed from the wastewater stream," says Scherff. "The membranes give me and my customers confidence that wastewater is properly and reliably treated according to all environmental regulations." Reliable filtration is also important because any violation of discharge limits will result in the local sewage district levying fines and imposing a stringent testing regimen to make the plant prove that the problem is corrected. CWT's closest competitor uses a conventional treatment process that involves adding chemical coagulants along with acids and bases to adjust pH and to settle the disposable solids. This process is labor-intensive, consumes large quantities of chemicals, and generates a great deal of sludge material. "Although my membrane system required a higher up-front capital investment, I will always have the overall cost advantage because of my lower chemical consumption, labor costs, and sludge disposal costs," says Scherff. He also notes that the significantly lower chemical consumption of membrane systems makes the process safer for employees and significantly reduces the need to manufacture, transport, and dispose of chemicals, which also benefits the environment. CWT initially installed a tubular system, using half-inch nominal diameter membranes. Unfortunately, CWT experienced mixed results with the membrane system that was initially installed. Although the system produced clean discharge water, CWT faced problems with fouling, and the system required frequent and time-consuming cleanings "One of the key reasons for utilizing a membrane system was to reduce labor costs, but we found ourselves spending as much time cleaning the system as we spend processing wastewater," says Scherff. "We knew almost immediately that we needed to find a different membrane solution."

Rather than purchase a completely new system, CWT decided to retrofit its filtration system to incorporate the one-inch tubular FEG Plus membranes from Koch Membrane Systems Inc., (KMS) of Wilmington, MA. The one-inch diameter membrane design provided a wider flow channel and better resistance to fouling. Scherff says the FEG membranes are able to handle the high solid content of CWT's wastewater and the high variability between different wastewater streams. The membrane's PVDF chemistry provides temperature and chemical resistance, and its unique sponge-ball cleaning method provides a mechanical cleaning process that significantly reduces downtime and the consumption of chemicals. "By switching to the KMS tubular membranes, we are spending much less time cleaning the membrane system and, therefore, dramatically increasing our productivity," says Scherff. "With the KMS membranes, we are processing anywhere from 8,000 to 15,000 gallons per day, depending on the composition of the wastewater. With the other membranes, we processed only about 5,000 gallons per day because the fouling reduced membrane performance, and we were cleaning six to eight hours per day." The new FEG membranes allow CWT to process wastewater 24 hours a day, and the only downtime is during cleaning or on an occasional Sunday when there is no wastewater to process. CWT also decreased the cleaning time of its small process tank to once every other day.

Using these membranes, systems with larger tanks could decrease cleaning time even more. "We spent thousands of dollars up-front, automating our process control systems to the point where it is actually not necessary to have anyone here. It is completely automated with all sorts of process controls built in. Only a low fouling membrane system can achieve this level of automation," says Scherff. KMS engineers helped CWT design the system. With their assistance, Scherff and his staff of four learned to predict how long it would take to treat each batch, despite the wide variability in wastewater composition. This predictability allows CWT to optimize the utilization of the entire treatment plant. Scherff says the membrane system is simple and clean with low operating costs. "Our biggest accomplishment, which we are most proud of, is that we have not had a single violation of our discharge permit in the 17 months since the first day of operation. And that is something that our competitors cannot say." *Additional information about FEG membranes is available from Koch Membrane Systems Inc., 850 Main St., Wilmington, MA 01887, by calling 888-677-5624 or visiting www.kochmembrane.com. FEG membranes remove solids, oily wastes, and metals from wastewater streams in a variety of industries*

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